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ABSTRACT

The effect of changes in the achievement level of black high school students on their chances of attending postsecondary schools was assessed. Data from the High School and Beyond survey 1980 sophomore cohort were used to estimate the probability of attending two-year and four-year colleges for blacks and whites, given changes in black achievement levels. The analysis indicates that if the gap between blacks and whites was reduced by 50%, the chances of attending a postsecondary school for a black student with average achievement would increase by nine percentage points. If there was a 75% reduction in the achievement gap, black and white students would be about equally likely to attend postsecondary schools, and if the achievement gap was eliminated, there would be a higher attendance rate for blacks than for whites. Potential increases in attendance would be reflected primarily at four-year colleges, particularly at the higher achievement levels. The statistical model and procedures for calculating the impact of increasing achievement of blacks on postsecondary attendance are described. Data are included on the estimated simulated effects on college attendance as average reading and math achievement are increased for black students. (SW)

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CHANGES IN ACHIEVEMENT LEVELS AND ATTENDANCE IN POSTSECONDARY SCHOOLS: A TECHNICAL NOTE

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Overview

In this technical note we analyze the impact of changes in the achievement level of black high school students on their chances of attending postsecondary schools. Our hypothesis is that part of the difference in postsecondary attendance rates of black and white youth can be accounted for by differences in the achievement of the two groups. For this analysis, we used data from the High School and Beyond survey to estimate the probability of attending two- and four-year colleges for blacks and whites given changes in black achievement levels.

The results show that the chances of black students attending postsecondary institutions increase considerably if their achievement levels are similar to that of their white counterparts. More specifically, the analysis shows that:

- if the achievement gap between blacks and whites was reduced by 50 percent, the chances of attending a postsecondary school for a black student with average achievement would increase by 9 percentage points;
- if there was a 75 percent reduction in the achievement gap, black and white students would be about equally likely to attend postsecondary schools; and
- if the achievement gap was eliminated, the chances of attending postsecondary schools for blacks would increase by 22 percentage points resulting in a higher rate of attendance for blacks than for whites.

Further, the analysis demonstrates that these potential increases in postsecondary attendance rates for blacks, given a reduction of the achievement gap, would be reflected primarily in increased attendance in four-year colleges, particularly at

higher achievement levels. Increases in achievement levels for blacks would only modestly affect the probability of attending two-year colleges. In the remainder of this note, we present the data, statistical model, and the results.

The Data

Data for this analysis were taken from the 1980 sophomore cohort of the Center for Education Statistics' High School and Beyond Survey. Data are available for these students when they were sophomores (1980), seniors (1982), and two years after high school (1984). While more than 25,000 high school sophomores were initially interviewed in 1980, only about 15,000 were followed for the four-year period (1980 to 1984). This longitudinal sample forms the basis of the analysis. The data were collected from a multistage, stratified cluster sample of more than 1,100 schools. For purposes of this analysis, only students classified as white or black were selected, resulting in an effective sample size of 10,000.

The variables used were race, sex, reading and math achievement scores, urban residence, family income, and mother's educational attainment. Each of these variables refers to students' status in 1982, when most were seniors. The outcome variable (i.e., the dependent variable) shows whether a student had dropped out of high school; only completed high school; or attended a vocational, two- or four-year institution after completing high school by 1984.

Family income and mother's educational attainment are obtained from student reports and therefore may be the subject of random and/or systematic measurement error. Analyses by Rosenthal, Myers, Ellman, and Milne (1983) have shown that there are considerable discrepancies between parent and student reports of these items, particularly for family income. Analysis of the base year (1980) family income data from High School and Beyond showed that the correlation between student and parent reports was about .3. Further, there was a $15,000 dollar difference in mean family income as reported by students and parents. The analysis also showed that the correlation between student and parent reports of parental education are about .8 and that, on average, there is only a small difference in student and parent reports of average mother's educational attainment. While a similar analysis was not undertaken for the 1982 reports of mother's educational attainment and family income, we would expect similar results. The imperfect measurement of the these two variables, particularly family income, may bias the estimates of the statistical model.

The Statistical Model and Procedures for Calculating the Impact of Increasing Achievement of Blacks on Postsecondary Attendance

In this section, we present the statistical model and the mathematical manipulations used to derive the impact of increasing achievement levels on the chances of black students attending postsecondary institutions.

The Statistical Model. To estimate the impact of changes in achievement levels on the chances of black students attending college, a multinomial logit model was estimated. This model permits us to relate the probability of being a high school dropout; only a high school graduate; attending a vocational, or a two-year or four-year college to each of the independent variables in the analysis, including reading and math achievement test scores. The model has the following form:

$$Pr(Y_i=h) = \exp(X_i B_h)/\Sigma\exp(X_i B_k).$$

Y_i refers to student i's (i=1, ... ,N) schooling status between the time they left high school and 1984. The specific schooling categories considered in the analysis are listed below:

h = 0 if a student dropped out of high school;

h = 1 if a student only stayed in school;

h = 2 if a student attended a vocational school;

h = 3 if a student attended a two-year college; and

h = 4 if a student attended a four-year college.

X is a vector of independent variables, and B_k is a conformable vector of parameters to be estimated. To obtain a unique solution, we normalize B_1 to equal 0. Parameter estimates were obtained using the method of maximum likelihood.

The independent variables in the X vector are the following:

black (=1 if a student is black, 0 otherwise);

family income in dollars;

reading achievement test score;

math achievement test score;

male (=1 if a student is male, 0 otherwise);

urban residence (=1 if student lives in an urban area, 0 otherwise);

mother's educational attainment (coded in years of schooling attained);

black x family income interaction;

black x reading achievement interaction;

black x math achievement interaction;

black x male interaction;

black x urban interaction; and

black x mother's educational attainment.

In addition to these variables, a constant term is included in the model. Using this specification, it is possible to show whether black students with high achievement test scores have postsecondary attendance rates similar to those of white students, even when other variables such as family income, mother's education, and place of residence are statistically held constant.

Calculation of the Impact of Increasing Achievement Levels. To calculate the impact of increasing achievement levels on the probability of black students attending postsecondary schools, we mathematically simulate changes in

the achievement levels of black students. For example, we show the extent to which the chances of attending postsecondary schools increase if the average black student achieves at the same level as the average white student.

Estimation of the impact of increasing achievement levels on black students' postsecondary attendance was accomplished in the following manner. First, the parameters of the multinomial logit model were estimated using the High School and Beyond data. Second, predicted probabilities of attending postsecondary schools were obtained by applying the multinomial logit equation to each student in the sample. Average probabilities were calculated separately for whites and blacks. These average probabilities served as a baseline from which to make comparisons as we simulated changes in the achievement level of students. Next, we substituted a set of alternative reading and math achievement levels in place of those observed in the sample for black students. The probabilities derived under the alternative conditions were then subtracted from the baseline probabilities. The differences in probabilities show the effect of changes in the achievement levels.

Results

Table 1 presents parameter estimates for the multinomial logit model along with selected summary statistics. Table 2 presents estimates of the simulated effects of changes in achievement on the probabilities of attending two- and four-year colleges. For reference, we note that the weighted sample

probabilities of attending two- and four-year colleges for white and black sophomore students are .19, .30, .16, and .20, respectively.

In Table 2 we present the simulated effects on postsecondary attendance as average reading and math achievement are increased for black students. Each of the four rows presents results obtained by reducing the achievement gap between blacks and whites by approximately 25, 50, 75, and 100 percent.

Table 2 shows that as the achievement gap between blacks and whites is reduced, black students become more likely to attend a two- or a four-year college. A 25 percent reduction in the achievement gap between black and white students corresponds to an increase in the probability of attending two- and four-year schools of .03 (3 percentage points) and .01 (1 percentage point), respectively. A 50 percent reduction corresponds to an increase in attendance of .04 (4 percentage points) for two-year schools and .05 for four-year schools. A 75 percent reduction in the achievement gap increases the probabilities for two- and four-year schools by .04 and .10. Elimination of the achievement gap (a 100 percent reduction) corresponds to an increase of .04 and .18 for attendance in two- and four-year schools, respectively. Interestingly, when the achievement gap is eliminated, black students that achieve

at the same average level as whites are more likely to attend two- and four-year colleges than the average white student.

The effect of changes in achievement levels on the probability of attending either a two-year or a four-year college closely follows the effect of changes in achievement levels on the chances of attending four-year colleges, particularly at the higher achievement levels. At the low end of the scale relatively small changes are detected in the chances of attending a two- or four-year school. In other words, the probability of attending a four-year college is more sensitive to changes in achievement level than that for two-year colleges. This finding may be related to differences in the admissions policies of two- and four-year colleges. Two-year colleges tend to have more open admissions policies than do four-year schools and do not screen applicants as rigorously on academic performance as four-year colleges.

REFERENCES

Rosenthal, A., D. Myers, F. Ellman, and A. Milne (1983). "The Failure of Student-Parent Cross-Validation in the High School and Beyond Survey." Paper presented at the annual meeting of the American Statistical Association, Toronto.

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Table 1. Parameter Estimates for Multinomial Logit Model

VARIABLES	PARAMETER ESTIMATES: DROP-OUT	T-RATIO	VOC ED	T-RATIO	TWO-YEAR	T-RATIO	FOUR-YEAR	T-RATIO	WHITE MEAN	BLACK MEAN
CONSTANT	-0.13625	-0.38	-2.36265	-7.32	-4.61138	-18.35	-7.82814	-29.36	1.00	1.00
FAMILY INCOME	-0.00001	-2.48	0.00000	0.11	0.00002	6.32	0.00003	10.59	26940.26	19401.24
READING	-0.02700	-2.09	-0.00654	-0.57	0.03004	3.35	0.09285	10.16	8.84	4.92
MATH	-0.12981	-9.27	0.06237	5.33	0.10377	11.37	0.23467	24.61	7.99	3.38
MALE	0.19248	2.17	-0.41103	-4.87	-0 43477	-6.62	-0.45336	-6.77	0.49	0.47
BLACK	-0.80120	-1.08	-0.06549	-0.09	6 34177	1.34	4.33241	6.89	NA	NA
COMMUNITY	0.71281	6.60	0.24437	2.13	0.05675	0.60	0.22649	2.41	0.15	0.48
MOTHER'S EDUC	-0.04996	-1.65	0.06782	2.51	0.23068	11.38	0.33227	16.32	12.59	12.26
RACE * INCOME	0.00003	3.37	-0.00001	-0.97	-0.00001	-1.13	-0.00002	-2.25		
RACE * READING	-0.10609	-3.23	0.00973	0.32	-0.00383	-0.14	-0.01760	-0.67		
RACE * MATH	0.04609	1.21	0.00462	0.14	-0.01217	-0.43	-0.03055	-1.13		
RACE * SEX	-0.01867	-0.10	-0.80069	-3.82	-0.35923	-2.02	-0.56620	-3.16		
RACE * COMMUNITY	-0.24875	-1.22	-0.26633	-1.25	-0.18652	-0.99	-0.31934	-1.71		
RACE * MOTHER'S EDUC	0.03220	0.51	0.07350	1.22	-0.00779	-0.15	-0.18145	-3.53		

Log Likelihood = -12,347

12

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Table 2. Reduction in the Black-White Achievement Gap and Changes in the Probability of Postsecondary Attendance

Reduction in Achievement Gap	Increased Black Attendance		
	Two-Year	Four-Year	Total
25%	.03	.01	.04
50%	.04	.05	.09
75%	.04	.10	.14
100%	.04	.18	.22